Subject Code: R13107/R13 **Set No - 1**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE and Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1. (i) Write iterative scheme to find the cube root of a real number K(>0).
   (ii) Express shift operator E in terms of exponential function.
   (iii) Given $y' = x + y,\ y(0) = 1$, find the value of y(0.4) (take h = 0.2) using Euler's method.
   (iv) Find Fourier series of f(x) = |x| in (–2, 2).
   (v) If F_p is complex Fourier transform of f(x), then find the complex Fourier transform of f(x) cos ax.
   (vi) Prove that $Z(\sinh nt) = \dfrac{z \sinh t}{z^2 - 2z\cosh t + 1}$.

[3+3+3+3+5+5]

PART–B

2.(a) Find positive root of $x^3 - 5x + 3 = 0$ using bisection method up to 4 steps.
   (b) The population of a town in the decimal census is given below. Estimate the population of a town for the year 1895

Year X	1891	1901	1911	1921	1931
Population Y	46	66	81	93	101

[8+8]

3.(a) Using Newton-Raphson method Compute $\sqrt{41}$ correct to 4 decimal places.
   (b) Using Lagrange's interpolation formulae find the value of y(12) from the data

X	4	7	8	10
Y	10	15	17	21

[8+8]

4.(a) Solve $y' = xy + 1$, y(0)=1 using Taylors method up to 3^{rd} degree term and compute y(0.1).
   (b) Find the fourier series of $f(x) = x^2 - x$ in $(-\pi, \pi)$. Hence deduce that $\dfrac{1}{1^2} + \dfrac{1}{2^2} + \dfrac{1}{3^2} + \ldots = \dfrac{\pi^2}{6}$.

[8+8]

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5.(a) Find half range sine series of $f(x) = \begin{cases} 1, & 0 < x < \frac{\pi}{2} \\ -1, & \frac{\pi}{2} < x < \pi \end{cases}$.

(b) Use Runge-Kutta 4th to compute y(1.25) given that $\frac{dy}{dx} = \frac{x+y}{x}$, $y(1) = 2$

[8+8]

6.(a) Find Fourier transform $f(x) = \begin{cases} x \ if \mid x \mid \leq a \\ 0 \ if \mid x \mid > a \end{cases}$.

(b) Find Z-transform of $n^2 a^n$.

[8+8]

7.(a) Find Fourier cosine transform of $e^{-ax}, a > 0$ and hence deduce the inversion formula.

(b) If $Z[f(n)] = \frac{z}{z-1} + \frac{z}{z^2+1}$, find Z[f(n + 2)].

[8+8]

Subject Code: R13107/R13 **Set No - 2**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE and Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) Using a numerical method for the square root of 11.

(ii) P.T. $\delta = E^{1/2} - E^{-1/2}$.

(iii) If $y' - x + y$, $y(0.4) = 1.48$, find y(0.9) with h = 0.25 using Euler's method and compare it with exact solution.

(iv) Find the Half range Fourier sine series of f(x) = |x| in (0, 1).

(v) Prove $F[x^n f(x)] = (-i)^n \frac{d^n}{dp^n}[F(p)]$.

(vi) Prove that $Z(\cosh nt) = \frac{z(z - \cosh t)}{z^2 - 2z\cosh t + 1}$.

[3+3+4+4+4+4]

PART–B

2.(a) Find the root of the $x^4 - x^3 - 2x^2 - 6x - 4 = 0$ lying between 2 and 3 upto 4 stages.

(b) Use Gauss forward interpolation formulae to find $f(30)$ solve that
f(21) = 18.4, f(25) = 17.8, f(29) = 17.1, f(33) = 16.3 and f(37) = 15.5.

[8+8]

3.(a) Find a positive root of $2x = 3 + \cos x$ by using Newton-Raphson method.

(b) Using Lagrange's Interpolation formula for the value of $y(1.3)$ given the following table

X	0.7	0.9	0.95	1.2
Y	1.25	1.5	2.0	2.7

[8+8]

4.(a) Solve $y' = y - x^2$, $y(0) = 1$ using Picard's method up to third approximation and hence find the value of y(0.1).

(b) Find the Fourier expansion of $f(x) = x\cos x$, $0 < x < 2\pi$.

[8+8]

5.(a) Find half range cosine series of $f(x) = \begin{cases} 1, & 0 < x < \frac{\pi}{2} \\ -1, & \frac{\pi}{2} < x < \pi \end{cases}$.

(b) Find y(0.1) using 4th order Runge-Kutta method given that $y' = x + x^2 y,\ y(0) = 1$.

[8+8]

6.(a) Find the Fourier transform of $\frac{1}{\sqrt{|x|}}$.

(b) Find Z-transform of $n^2 e^{n\theta}$.

[8+8]

7.(a) Find Fourier cosine transform of $\frac{1}{1+x^2}$ and hence find Fourier sine transform of $\frac{x}{1+x^2}$.

(b) Solve $y(n+2) + 3y(n+1) + 2y(n) = 0,\ y(0) = 0, y(1) = 1$ using Z-Transform.

[8+8]

Subject Code: R13107/R13 **Set No - 3**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE and Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) Find reciprocal of a real number K using Newton-Raphson method.

(ii) Prove that $\mu = \frac{1}{2}[E^{1/2} + E^{-1/2}]$.

(iii) Employ Taylor's method to obtain the values of y(1.1) for the differential equation $y' = xy^{1/3}, y(1) = 1$. Compare the solution with exact solution.

(iv) A sinusoidal voltage $E \sin \omega t$ is passed through a half wave rectifier which clips the negative portion of the wave. Develop the resulting periodic function

$$u(t) = \begin{cases} 0 & , -\frac{T}{2} < t < 0 \\ E \sin \omega t, & 0 < t < \frac{T}{2} \end{cases}, T = \frac{2\pi}{\omega}$$ as Fourier series.

(v) Prove that $F\left[\frac{d^n}{dx^n} F(x)\right] = (-ip)^n F(p)$

(vi) Prove that $Z(\sin nt) = \frac{z \sin t}{z^2 - 2z \cos t + 1}$.

[3+3+4+4+4+4]

PART–B

2.(a) By using Regula-Falsi method for a real root of $xe^x = 2$ up to 4 stages.

(b) Using a Backward difference formula, find y(8)from the given table

X	0	5	10	15	20	25
Y	7	11	14	18	24	32

[8+8]

3.(a) Using Newton-Raphson formula, find the root between 0 and 1of $x^3 = 6x - 4$ correct to 3 decimal places.

(b) Using Lagrange's Interpolation formula, find the value y(2) given the following table of values

X	1	1.1	1.4	1.8
Y	2	4	8	11

[8+8]

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Subject Code: R13107/R13 **Set No - 3**

4.(a) Using Euler's method, solve for y at x = 0.5 from $y' = 2xy$, $y(0) = 1$ using step size 0.25.

(b) Find the Fourier series of $f(x) = \begin{cases} 0 & , -\pi < x < 0 \\ \frac{\pi x}{4}, & 0 < x < \pi \end{cases}$ and hence deduce that

$1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots = \frac{\pi^2}{8}$.

[8+8]

5.(a) Represent the function as Fourier sine series $f(x) = \begin{cases} \frac{\pi}{2} & , 0 < x < \frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \pi \end{cases}$

(b) Use Runge-Kutta 4th order to compute y(1.25) for the equation $y' = \frac{x+y}{x}$, $y(1) = 2$.

[8+8]

6.(a) Find the Fourier sine transform of $\frac{e^{-ax}}{x}$.

(b) If $Z[f(n)] = \frac{z}{z-1} + \frac{z}{z^2+1}$ find Z [f(n + 2)].

[8+8]

7.(a) Find Fourier transform of $f(x) = \begin{cases} x & if \mid x \mid \leq a \\ 0 & if \mid x \mid > a \end{cases}$.

(b) Solve $u_{n+2} - 6u_{n+1} + 9u_n = 0$ using Z-transform.

[8+8]

Subject Code: R13107/R13 **Set No - 4**

I B. Tech I Semester Supplementary Examinations Sept. - 2014

MATHEMATICS-II (MATHEMATICAL METHODS)

(Common to ECE, EEE, EIE, Bio-Tech, EComE and Agri.E)

Time: 3 hours **Max. Marks: 70**

Question Paper Consists of **Part-A** and **Part-B**
Answering the question in **Part-A** is Compulsory,
Three Questions should be answered from **Part-B**

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PART-A

1.(i) Evaluate $\sqrt[3]{28}$ to four decimal places by Newton-Raphson method.

(ii) If the interval of differencing is unity, $\Delta \tan^{-1}\left(\frac{n-1}{n}\right) = \tan^{-1}\frac{1}{2n^2}$.

(iii) Using Taylor's series method obtain y(0.2) for the differential equation $y' - 2y = 3e^x, y(0) = 0$. Compare with exact solution.

(iv) Find the Fourier series of $f(x) = |\cos x|$ in $(-\pi, \pi)$.

(v) Find Fourier transform of $f(x) = \begin{cases} 1, & |x| < a \\ 0, & |x| > a \end{cases}$ and hence evaluate $\int_0^\infty \frac{\sin p}{p} dp$.

(vi) Prove that $Z(\cos nt) = \frac{z(z - \cos t)}{z^2 - 2z\cos t + 1}$.

[3+3+4+4+4+4]

PART–B

2.(a) Find a real root of $x^3 - 4x - 9 = 0$ using Regula-Falsi method up to 4 stages.

(b) Using Gauss Backward difference polynomial, find y(5) given that

X	0	3	6	9	12
Y	5	11	13	15	17

[8+8]

3.(a) Using Newton-Raphson method, find a positive root of $\cos x - x e^x = 0$.

(b) Using Lagrange's Interpolation, find f(x)

X	4	7	8	10
Y	10	15	17	21

[8+8]

4.(a) Using Euler's method, solve for y at x = 0.4 from $y' = 2xy, y(0) = 1$ using step size 0.2

(b) Find the Fourier series of periodicity 3 for $f(x) = 2x - x^2$ in 0 < x < 3.

[8+8]

5.(a) Represent the function as Fourier cosine series $f(x)=\begin{cases}\frac{\pi}{2}, & 0<x<\frac{\pi}{2}\\ \pi-x, & \frac{\pi}{2}<x<\pi\end{cases}$.

(b) Estimate y(0.2), given $y'=3x+\frac{y}{2}, y(0)=1$ using Runge-Kutta 4th order.

[8+8]

6.(a) Find Fourier Sine transform of $\frac{e^{-ax}}{x}$.

(b) Find the Z-transform of {x(n)} = $n z^n$

[8+8]

7.(a) Find Fourier transform of $f(x)=\begin{cases}\frac{1}{2a}, & |x|\leq a\\ 0, & |x|>a\end{cases}$.

(b) Solve $u_{n+2}-u_n=2^n, u_0=0, u_1=1$ using Z-transform.

[8+8]